REPORT ON AGT 2007

Algorithmic Game Theory workshop, Warwick, 2007

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The University of Warwick, which has a long-standing history in Algorithms & Complexity, was recently awarded an EPSRC/HEFCE grant to establish a new Centre for Discrete Mathematics and its Applications (DIMAP). The support given has enabled the establishment of one Professorship in Computer Science, three permanent lectureships (in Computer Science, Mathematics, and Operations Research), and the appointment of several postdoctoral research fellows and PhD students. DIMAP also has plans to hold workshops, and host visitors, in the area of Discrete Algorithms. More details can be found on the DIMAP website, at `http://www.dcs.warwick.ac.uk/dimap/`.

This "conference report" is reporting on the first DIMAP event, the international workshop on Algorithmic Game Theory (AGT), which was held during March 25 - 28th, 2007. The AGT workshop took place in the (relatively) new Mathematics and Computer Science buildings on the University of Warwick campus, located in the West Midlands region of the UK. The five keynote speakers for the workshop were Noam Nisan, Christos Papadimitriou, Tom Roughgarden, Eva Tardos and Vijay Vazirani. There were 23 other invited speakers, including many well-known figures from the world of Algorithmic Game Theory. Added to this

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were many students, faculty and researchers from the UK, Europe, and the rest of the world, making a total of about 75 enthusiastic participants.

The workshop started early on the morning of Sunday 25th, with Uri Zwick giving the opening talk on "Simple Stochastic Games, Mean Payoff Games and Parity Games", standing in for keynote speaker Vijay Vazirani, whose plane had been delayed. Vijay eventually arrived after lunch, and in the afternoon presented his talk about algorithms for computing equilibria in classical and modern markets, including some applications for Google's AdWords. The day's program ended with two talks on unrelated machine scheduling, by Yossi Azar and Elias Koutsoupias. The evening meal took place in Radcliffe House on campus.

The first talk on Monday was given by Éva Tardos, who presented game theoretic results for price-setting in Networks in a perfect-information setting. The main theme on Monday was Nash Equilibria, and in particular different notions of approximation for Nash Equilibria. Kousha Etessami discussed the complexity of finding an ϵ-close approximation to a Nash equilibrium vector, and related this problem to the Sqrt-Sum problem. After lunch Christos Papadimitriou presented work on a different notion of approximation: the ϵ-approximate Nash Equilibrium (where no player may improve by more than ϵ by changing strategy). He discussed this problem in the context of pure and mixed strategies. For mixed strategies, there is no PTAS for this problem unless PPAD=P; however a 0.38-approximation is known to exist. In the afternoon, Paul Spirakis continued the subject of ϵ-approximate NE, in particular well-supported ϵ-approximate NE. On Monday evening there was a short reception to mark the official opening of DIMAP, followed by a panel discussion on the future of Algorithmic Game Theory. Members of the panel had differing opinions on the amount of remaining work to be done on Algorithmic Game Theory; however everyone was able to come up with open problems. These varied from specific questions such as resolving the approximation status of the ϵ-approximate NE problem, to Frank Kelly's hopes for a game-theoretic solution to the problem of email spam.

Tim Roughgarden kicked off Tuesday's program with a talk about Moulin Mechanisms with low social cost, giving a broad overview of what has been done in this area, as well as presenting recent results for the network design problem. Most of Tuesday's talks continued on the theme of network design and congestion in networks. Talks ended early at 3pm for the workshop excursion to Kenilworth Castle, a large ruined castle about 3 miles from the University. It was a sunny day so we spent a couple of hours looking through the buildings and walking round the gardens. After that we took the scenic route (via a pub) to the Cross restaurant in Kenilworth town, where an excellent dinner was served.

The final set of talks took place on Wednesday morning. The last talk of the workshop was given by Piotr Krysta, who spoke about approximation algorithms and NP-hardness results for different multi-product pricing systems.

I have only mentioned a few of the talks in this report. The complete and final schedule of the workshop (with slides for each of the talks) can be seen at http://www.dcs.warwick.ac.uk/dimap/EVENTS/AGT-2007/schedule.html.

The AGT workshop organisers were Artur Czumaj, Marcin Jurdzinski, Mike Paterson, and Rahul Savani, all from the University of Warwick. They did an excellent job of taking care of registration, email facilities, and showing us around Kenilworth on Tuesday. Many participants were captured on camera by Artur Czumaj, Mike Paterson and Michal Rutkowski. The photos appear online at http://www.dcs.warwick.ac.uk/~agt2007/GALLERY/